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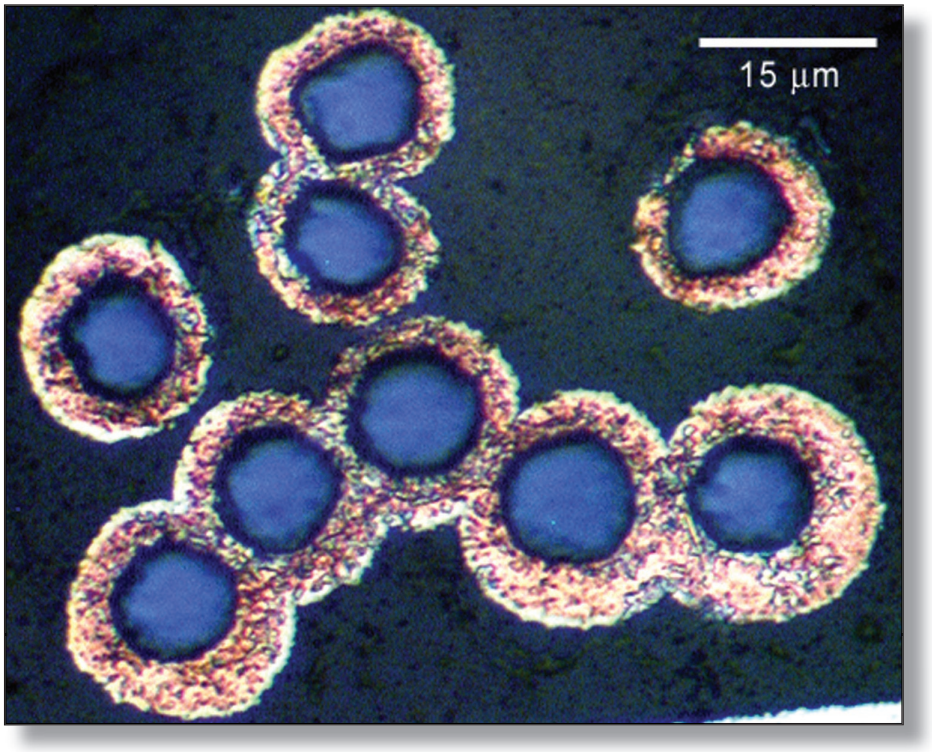
Science and Technology for Tomorrow's Air and Space Force

Success Story

RESEARCHERS DEVELOP HIGH-PERFORMANCE, METAL-POLYMER HYBRID SIGNAL WIRING FOR AIRCRAFT AND SPACECRAFT



To date, researchers have successfully demonstrated the ability to combine high-strength, high-temperature polymer fibers with conductive metal precursors, resulting in the conductive, flexible, lightweight, and durable fibers needed to produce polymer signal and shielding wires. This technology demonstrates 300% strength and 50% weight advantage over copper wiring. Thus, polymer wiring shows significant potential for applications where flexibility, weight savings, and mechanical durability could increase the life, while reducing maintenance and costs associated with commercial and military aircraft and spacecraft.

Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

Engineers at the Materials and Manufacturing Directorate, working with Syscom Technology, Inc. and Boeing under an Air Force Small Business Technology Transfer program, have developed a conductive, lightweight, mechanically robust polymer-based wire. Manufacturers could use this wire as an alternative to thin copper signal wire, and it may have other uses such as an alternative to aluminum braid wiring for electromagnetic interference (EMI) shielding for aircraft and spacecraft.

Background

A typical Air Force bomber or transport aircraft has nearly 150 miles of power and signal wiring. In order for aircraft components to remain functional, wires within the system must be conductive and robust.

Aircraft maintenance workers have noticed the wiring commonly used in an aircraft's EMI shielding and signal-processing components can lose ductility and conductivity over time. Complicating matters further, insulation damage and corrosion result from heat generated by aircraft systems and exposure to fluids. Any malfunction within an aircraft's wiring could require untimely maintenance and impact mission readiness.

Directorate engineers are developing advances in preventative maintenance, interconnecting technologies, and new materials to meet the challenges associated with aging wiring and aircraft. Syscom Technology, Inc., along with Boeing-Phantom Works, has developed an alternative metal-polymer hybrid wiring.

The matrix material is a polymer fiber called poly p-phenylene benzobisoxazole (PBO), and Syscom prepares PBO from a nematic liquid crystalline solution. Syscom electroplates the high-performance polymer fibers with silver, copper, and nickel to form a high-strength, low-resistance, metal-polymer hybrid wire.

Syscom engineers developed the processing scheme, which is adaptable to large-scale production, and already produced 1,500 ft of the fiber. Directorate engineers are conducting a materials analysis to characterize the physical and electrical properties of the polymer wiring.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-40)